

Chapters 6 & 7 Review
Periodic Properties/Electron Configuration Review

1. Place the correct answer in the space provided.

- a.) number The properties of the elements are a periodic function of their atomic (number / mass).
- b.) I Which element is more chemically similar to Br? (Se, Kr, B, or I)
- c.) alkaline earth metals Name the group which all contain 2 valence electrons.
- d.) Which electron configuration notation is incorrect? ($3p^4$, $7s^1$, $4f^{12}$) exceeds total for a p-orbital
- e.) 5d Which orbital has the most energy? ($6s^1$, $4f^1$, $5d^3$) → filled last (Aufbau order in P.T.)
- f.) it depends on the period What is the maximum number of valence electrons that an atom can have?
Row #1: 2 (only) Row #4: 18 (s, p & d)
 Rows 2 & 3: 8 (s & p) Rows #5+: 32 (s, p, d, f)
- g.) $3, 1, 0, +1/2$ Two electrons share an orbital. If one electron has the quantum value: $3, 1, 0, +1/2$, what is the others?
 $n, l, m_l, m_s \Rightarrow 3p$
 $7L \leftarrow n=3, l=1, m_l=0, m_s=+1/2$
- h.) Different based on their subshell All electrons of the phosphorous atom have (the same energies / different based on their subshell).
- j.) 6 What is the maximum number of electrons that the 2p sublevel can hold.
 $7L \leftarrow 2p$

2. Write the condensed electron configurations for each of these species:

As	<u>$[Ar] 4s^2 3d^{10} 4p^3$</u>
Rh(III) <u>Rh (+3)</u>	<u>$[Kr] 4d^6$</u>

(Noble gas before it) valence e⁻s
→ lose from highest 'n' 1st then 'n-1' if tied: Rh⁰ $[Kr] 5s^1 4d^8$ b/c exception lose 1st then

3. Periodic Trends:

- a.) Which family of elements have the highest ionization energy? Why?
↳ group/column
 Noble gases b/c they have completely filled shells so it is hard to remove an e^- .
- b.) Why are the energy values of period 2 higher than those of period 3?
Electrons are closer to the nucleus in period 2 ∴ they have higher Z_{eff} (more attracted to the nucleus) ∴ they are more difficult to remove.

c.) Which element has the highest ionization energy? He

4. Circle the *larger* particle in each pair.

a.) Ca or K

b.) N or P

c.) Ne or He

d.) At or Ag

e.) O or O²⁻

f.) C or O

g.) Na or Na⁺

h.) Fe²⁺ or Fe³⁺

i.) Ba or Ca

↗ radius
↘ radius

anions

← add e⁻s ∴ larger

cations

← smaller b/c e⁻s remaining are attracted to more protons

5. Identify the element from the given information. Write the *symbol* of the element.

a.) Li lightest alkali metal

b.) Mn [Ar]4s²3d⁵

c.) S 3rd period with 6 valence electrons

d.) Ne completely filled 1st and 2nd energy level

e.) O 2s² and 2p² orbital notation: $\uparrow\downarrow$ $\uparrow\downarrow$ $\uparrow$ $\uparrow$

f.) Rn Heaviest noble gas

g.) Ca 4th period alkaline earth metal

h.) Cs 6th period element with a +1 charge

i.) Co neutral atom with 27 electrons

j.) N 2nd period with 5 valence electrons

k.) Po [Xe] 6s²4f¹⁴5d¹⁰6p⁴

l.) Br halogen and a liquid at room temperature

6. As an element's position is found further down group IVB (group 14)...

a.) the size of the atom (increases / decreases).

b.) it is (easier / more difficult) to remove outer electrons.

c.) they tend to (gain / lose) electrons in chemical reactions.

d.) they form (positive / negative) ions.

7. Indicate which atom/ion has the highest value of the given property:

a. Atomic Size

¹⁷Cl

or

⁵³I

or

³⁷Rb

b. Ionization Potential

²⁰Ca

or

³³As

or

⁵¹Sb

c. Ionic Size

²⁷Co⁺²

or

²⁷Co⁻²

or

³⁷Rb

↗ ↑ I.E.
↘ ↓ I.E.

8. I. What is its ~~new~~ ^{the} condensed electronic configuration of Fe^{+1} ? lose $1e^-$ from highest principal quantum #



II. What is its ~~new~~ ^{the} condensed electronic configuration of Fe^{+2} ? gain $1e^-$ in lowest Energy unfilled orbital



not filled so add here



Light Review

Radiation	Wavelength (nm)	Frequency (1/s)	Energy per photon (J)
Green light	550.	5.45×10^{14}	3.61×10^{-19}
Yellow light	580. 3 sig. figs.	5.17×10^{14}	3.43×10^{-19}

$$c = \lambda \nu$$

$$\nu = \frac{c}{\lambda}$$

* make sure to convert nm $\rightarrow$ m for your calculation

$$E = h\nu = h \left(\frac{c}{\lambda} \right)$$

$$\nu_{\text{green}} = \left(\frac{2.998 \times 10^8 \text{ m}}{\text{s}} \right) \left(\frac{1}{550. \times 10^{-9} \text{ m}} \right) = 5.45 \times 10^{14} \text{ s}^{-1} \text{ or Hz or } \frac{1}{\text{s}}$$

all units mean the same thing

$$E_{\text{photon green}} = (6.626 \times 10^{-34} \text{ J}\cdot\text{s}) (5.45 \times 10^{14} \text{ s}^{-1}) = 3.61 \times 10^{-19} \text{ J}$$

$$\nu_{\text{yellow}} = \frac{(2.998 \times 10^8 \text{ m/s})}{(580. \times 10^{-9} \text{ m})} = 5.17 \times 10^{14} \text{ s}^{-1}$$

$$E_{\text{photon yellow}} = (6.626 \times 10^{-34} \text{ J}\cdot\text{s}) (5.17 \times 10^{14} \text{ s}^{-1}) = 3.43 \times 10^{-19} \text{ J}$$